

Roots of Human Behavior

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Two books by Professor King reflect her desire to link her own research to broader questions in anthropology. In 1994, she published *The Information Continuum: Social Information Transfer in Monkeys, Apes, and Hominids* and, in 1999, both contributed to and edited *The Origins of Language: What Nonhuman Primates Can Tell Us*. In 2000, Professor King helped organize a major international symposium in Mexico on the anthropological use of the concept of *culture*. With Richard Fox, she is editing a volume of papers from that conference, to be called *Anthropology Beyond Culture*. This book will be published by Berg in 2002.

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Roots of Human Behavior

Scope:

In *Roots of Human Behavior*, we will explore the evolutionary links that humans share with our close relatives, chiefly the monkeys and apes. The significance of those links for understanding human behavior today will be thoroughly explored. This perspective has its disciplinary home in biological anthropology, one of the subfields of anthropology.

Because anthropology provides the framework for the course, we begin by defining its subject matter and the variety of approaches that anthropologists use when studying human behavior. One main tool of the biological anthropologist is the biocultural approach. Using this perspective, humans are analyzed both as products of their evolutionary past and as architects of their own current cultural contexts. Further, humans are seen as one type of anthropoid, a grouping of organisms that includes monkeys, apes, humans, and human ancestors. In this comparative approach, the behavior of anthropoids is broadly assessed to identify possible “roots of human behavior.”

The initial lectures focus on understanding the nature of our relationship with other anthropoids. To achieve this understanding, we must be able to distinguish, anatomically and behaviorally, not only between humans and other anthropoids, but also among major groupings of anthropoids. Monkeys and apes, in particular, differ crucially from each other, as we will see. Our four closest living relatives are all apes: orangutans, gorillas, chimpanzees, and bonobos. These four anthropoids will receive particular emphasis in this course. We will also address the key fact that humans have not evolved from these organisms directly, but rather from a common ancestor shared by them and humans.

We start our in-depth look at monkeys and apes by establishing that these are, without exception, highly social animals. Most species live in year-round social groups; all are characterized by long-term social bonds that develop between close associates (most often between relatives, such as mothers and their infants). Most biological anthropologists think that these bonds indicate underlying emotional attachments. The actual structure of these social groupings varies across species. We carefully distinguish the different social structures of the four great apes, for instance, but we concentrate on basic social patterns that most, or many, anthropoids share.

The middle section of the course is devoted to a search for the roots of various human behaviors: aggression and dominance in males versus females, sexual behavior and reproduction, social learning, tool using and tool making, cultural behavior, and social communication and language. Case studies are undertaken, relying heavily on the great apes and a few selected monkey species, to vividly illustrate the most compelling evidence.

Chimpanzees, for example, the most well studied great apes of Africa, provide us with case study information that is highly relevant to understanding tool using, tool making, social learning, and the presence of culture in other species. The termite-fishing chimpanzees studied by Jane Goodall in East Africa, and the nut-cracking chimpanzees more recently discovered in West Africa, tell us that the basis for our complex human technology lies in the capacities of our closest evolutionary cousins.

Bonobos, another African great ape, do not use such complex tools in the wild. They are, however, highly useful for showing that males are not inevitably aggressive and dominant (as they are, in fact, in chimpanzees). Female bonobos sometimes bond together and achieve equality with, and indeed dominance over, males. Comparing chimpanzee and bonobo behavior illustrates a key concept of the course: Few generalizations about the most complex behaviors can be made even across closely related anthropoids.

This basic approach to the evidence is multiplied across different case studies and different behaviors. Then, the penultimate lecture reviews the highlights of human evolution itself. This review is necessary to fill in the “gap” between living monkeys and apes, on the one hand, and ourselves, on the other. We fill the gap with the fascinating extinct hominids; hominid fossils allow us to reconstruct the anatomy and some of the behavior of our actual ancestors. The earliest hominids set themselves apart from earlier anthropoids by virtue of their bipedalism. Gradually, hominids became more sophisticated. They invented new stone tool technology; migrated out of Africa; and eventually, developed art and complex language.

What emerges from this course is a twofold notion. Many complex behaviors are unique neither to humans nor to their human ancestors. Yet, what we have inherited from our anthropoid forebears are not so much specific skills or

behaviors, but the ability to respond flexibly and adaptively according to the physical and social circumstances that confront us. We are not just bipedal, hairless chimpanzees or bonobos; we have taken some of the abilities passed along to us throughout anthropoid evolution and adapted them to our own unique environment. We conclude the course by stressing this point and by considering the implications of the biocultural perspective for understanding our place in today's world and our relationship with our fellow anthropoids.

Lecture One

The Four Facets of Anthropology

Scope: This lecture introduces the anthropological framework that undergirds this course, in which humans are seen as biocultural beings. That is, human behavior is seen to be influenced both by humans' biological makeup and by the cultural context in which humans live.

Anthropology is the comprehensive study of the human species. The subfield of biological anthropology compares humans with other *anthropoids*, a taxonomic grouping of primates that includes our own species, the human ancestors, and our closest living relatives, the monkeys and apes. This comparative approach, a cornerstone of scientific thinking since the masterful work of Charles Darwin in the nineteenth century, is based on an understanding of the evolutionary link between humans and other anthropoids. We will clarify the nature of that link, focusing on the fact that humans did not evolve *from* other anthropoids; rather, humans share a common ancestor with other anthropoids but subsequently developed on a unique evolutionary pathway.

In addition to explaining the characteristics that unite all anthropoids, this initial lecture clarifies differences among anthropoids. Learning what distinguishes monkeys and apes from each other—as well as from humans—is key to interpreting the information provided in subsequent lectures. Four types of great apes (chimpanzees, bonobos, gorillas, and orangutans) are especially crucial to this course because they are our closest living relatives.

Outline

- I. Over the next six hours, we will talk about our closest living relatives in the animal world, the monkeys and apes, and about what these creatures can tell us about how we live our own lives. Biological anthropology forms a disciplinary context for this approach to understanding human behavior.
 - A. Unlike other disciplines, anthropology approaches the study of humanity in a number of integrated ways: prehistorically, before writing was invented; across a variety of modern-day human cultures; and in comparison with certain other animals.
 - B. Four linked subfields compose the discipline of anthropology. Together, they form a coherent discipline but each approaches the study of human behavior in a unique way.
 - 1. Archaeology studies human behavior as reflected in patterns of the material culture, including everything from pottery to weapons to entire houses, from past societies.
 - 2. Cultural anthropology considers all aspects of behavioral and belief systems in all human groups, ranging from villages in remote Africa to corporations right here in the United States.
 - 3. Linguistic anthropology takes as its subject matter the languages of human groups in the present and the past.
 - 4. Biological anthropology, the context for this course, looks at the evolution of the human species in terms of both behavior and anatomy.
 - C. Two major related themes undergird biological anthropology.
 - 1. Humans are biocultural beings, unique by virtue of our own special abilities. Yet we are also anthropoid primates: a group that includes monkeys, apes, humans, and human ancestors.
 - 2. We must understand the evolutionary link we share with other anthropoid primates to fully understand our own humanity and our place in the world.
- II. Certain biological and behavioral characteristics unite the anthropoids.
 - A. Studying anthropoids as a group can help us see which of our human characteristics are shared by all anthropoids and which are unique to our own lives.
 - B. Anthropoids are united anatomically by certain shared characteristics.
 - 1. Nails (rather than claws) allow for the full development of the grasping hand, which in turn allows youngsters to cling to the mother's fur and enables efficient tree climbing, hand feeding, and manipulation of objects, including tools.

2. Forward-facing eyes (rather than one eye on each side of the head as in, say, a horse) make possible overlapping fields of visions and, thus, the clear perception of depth. Anthropoid eyes can also discriminate among different colors.
 3. A large, complex brain indicates that anthropoids are, as a group, the most intelligent animals on earth, capable of learning how to solve complicated problems. In some cases, monkeys and apes can plan ahead and remember the past.
- C. Anthropoids are united behaviorally by certain shared characteristics.
1. A commitment to social living is indicated by the fact that most anthropoids live in year-round coherent groups
 2. Social bonds among relatives and close associates mean that these social groups are made up of individuals with emotional ties and shared histories.
 3. Complicated patterns of learning and communication typify life in anthropoid social groups.
- III. Beyond these common features, certain groups of anthropoids differ in meaningful ways from other groups of anthropoids.
- A. Monkeys are relatively small-bodied anthropoids with arms and legs of equal length and a tail. Some are ground dwelling and some live in trees. They are less closely related to humans than are apes.
- B. Apes are larger anthropoids with longer arms than legs, differently designed joints for movement in the trees (though in many cases they use the ground also), and no tail. These anthropoids evolved later than the monkeys did and are more closely related to humans. For biological anthropologists, confusing apes with monkeys is a cardinal sin!
- C. Humans and our direct ancestors evolved most recently. The topic of human evolution is not a theme of this course, but it will be considered in one lecture. We will concentrate instead on monkeys and apes and what their behavior can tell us about the roots of human behavior.
- IV. The nature of humans' evolutionary link with the monkeys and apes, well known since the time of Darwin, is one of common ancestry.
- A. Humans did not evolve directly from monkeys and apes. Rather, humans shared a common ancestor with monkeys and apes, a key distinction for the content of this course.
- B. Humans and chimpanzee apes, for instance, shared a common ancestor about six million years ago. What this means is that humans did not develop from chimpanzees but rather shared a common evolutionary lineage until a "split point." At this split point, the human lineage developed one way, and the chimpanzee lineage, another.
- C. Charles Darwin, the co-creator of the theory of evolution, understood the importance of humans' shared history with other anthropoids. Darwin could explain a "split point" in an evolutionary lineage by focusing on different environmental "pressures" pushing two groups, each living in a slightly different environment, in two different directions.
- D. As we will see in the next lecture, our shared evolutionary heritage with other anthropoids has provided us with a fundamental social basis for life in groups and close emotional ties within those groups.

Essential Reading:

Park, *Biological Anthropology*, chapters 1, 4, and 5.

Rowe, *The Pictorial Guide to the Living Primates*.

Supplementary Reading:

Dennett, *Darwin's Dangerous Idea*.

Questions to Consider:

1. If you overheard someone saying that humans evolved from the apes, how would you go about explaining the inaccuracy in that claim?
2. Does it change your self-image in any way to think of yourself as an anthropoid as well as a unique human being?

Lecture Two

Social Bonds and Family Ties

Scope: Anthropoids are intensely social creatures. Monkeys and apes, like humans, live in year-round groups and thrive on long-term social bonds. How the groups themselves are structured, however, varies widely, ranging from small extended family groups to very large collections of males, females, and dependent young. After surveying these different possibilities, we will concentrate on distinguishing the social structures found among the four great apes.

Returning to commonalities rather than differences, we focus on four factors that together greatly influence an individual anthropoid's social life: age, sex, relative status or rank, and presence of relatives in the group. When studying monkey and ape groups, scientists routinely distinguish (and name) each individual, paying close attention to how these four factors affect individuals' life histories and the expression of social bonds.

We will see that enduring family ties—which many scientists believe are based on emotional attachments—exist in anthropoid groups. Important bonds may also be expressed between nonrelatives under certain circumstances. Exactly how these attachments are best reported and analyzed remains the subject of a debate in biological anthropology. This debate centers on anthropomorphism, the attribution of human characteristics to animals. No agreement exists about whether the practice of anthropomorphism is helpful or harmful to understanding the social lives of monkeys and apes.

Outline

- I. Monkeys and apes are found chiefly in tropical areas of the world, near the equator. About ninety percent of the monkeys and apes living today inhabit forests of various kinds.
- II. Almost without exception, monkeys and apes live in year-round social groups. The idea of a *solitary anthropoid* is a contradiction in terms.
 - A. The organization of anthropoid social groups varies.
 - 1. Youngsters, infants, and juveniles form the core of all anthropoid groups.
 - 2. Beyond this core, no one “typical” way exists in which anthropoid groups are organized.
 - 3. Considering the monkeys and smaller apes together, social organization may range from small extended family groups to very large troops composed of multiple males and females.
 - 4. The large multiple-male, multiple-female gatherings, including those of baboons and macaques, are among the most well studied of all anthropoid groups.
 - B. Extreme variation characterizes even the anthropoids most closely related to us. The four large-bodied kinds of apes, the *great apes*, will be emphasized in this course.
 - 1. Orangutans are less social than other anthropoids but still come together socially in certain situations.
 - 2. Gorillas live in one-male or two-male units with multiple females and offspring.
 - 3. Both chimpanzees and bonobos live in large communities with smaller “parties” coming together and apart.
 - C. Despite this great variation in social organization, four major factors together can be said to define an individual monkey's or ape's experience in its social group.
 - 1. Age greatly affects how others treat a monkey or ape. Infants, for example, are often exempt from rules and punishment.
 - 2. Being male or female will often determine whether a monkey or ape lives out its life in the group into which it was born or emigrates to another group at puberty.
 - 3. Presence of relatives, too, makes a big difference, because anthropoids surrounded by relatives have a ready source of aid in getting resources.
 - 4. Relative status or rank in the group affects what type of resources a monkey or ape is able to get.

- III. Anthropoid social groups are not random collections of individuals who stay together to get better access to food, water, and mating partners. Social groups are complex collectivities in which strong, long-term social bonds are in evidence.
- A. The strongest social bonds are most often found between relatives.
 - 1. Mother-infant and sibling-sibling bonds are frequently expressed through protection, support, grooming, play, and sometimes, through sharing of resources.
 - 2. In certain cases, grandparent-grandchild and father-infant relationships exist, too.
 - 3. Evidence shows that these kin relationships are meaningful to, and recognized by, the anthropoids themselves.
 - B. Nonrelatives may also express strong social bonds. Nonrelated monkeys and apes may form alliances to compete more effectively against others.
- IV. Researchers differ in exactly how to go about describing the social bonds and family ties that are visibly expressed in anthropoid groups.
- A. Some researchers embrace anthropomorphism.
 - 1. Anthropomorphism is the attribution of human characteristics to animals.
 - 2. Those who embrace anthropomorphism accept the idea that anthropoids think and express emotions.
 - 3. The world-famous chimpanzee expert Jane Goodall, for example, talks about apes experiencing grief at the death of a loved one.
 - 4. Even before Goodall, researchers in Japan embraced the idea that Japanese monkeys had individual personalities. Initially rejected, the Japanese view has become increasingly accepted in Western primatology.
 - B. Other scientists, however, reject anthropomorphism as inappropriate.
 - 1. Critics of anthropomorphism point out that we cannot get into the minds and hearts of our monkey and ape subjects.
 - 2. Anthropomorphism, these critics charge, leads to projecting human qualities onto animals that may, in fact, differ appreciably from humans in their capacities to feel and think.

Essential Reading:

Goodall, *Through a Window*.

Park, *Biological Anthropology*, chapters 7–8.

Supplementary Reading:

Cheney and Seyfarth, *How Monkeys See the World*, chapters 1–3.

Fossey, *Gorillas in the Mist*.

Questions to Consider:

1. Given that the great apes vary in how their social groups are set up, can you think of several important social patterns these anthropoids share?
2. Do you think anthropomorphism in describing the behavior of monkeys and apes is more beneficial or more harmful to our scientific understanding of ourselves?

Lecture Three

The Journey Away from Mom

Scope: Without exception, the most enduring relationship in anthropoid groups is between a mother and her infant. The infant's entire social world at first *is* the mother and only gradually expands out from there. Right from birth, monkey and ape infants cling to the mother; development proceeds slowly compared to that in other mammals, with long years of dependency before maturity is reached.

When youngsters attain the age of puberty, one sex or the other (and sometimes both) transfers to another group for mating. This period of *dispersal* can be dangerous and traumatic, and it forever changes the nature of the mother-young bond. Yet maternal personalities and temperaments seem, in at least some cases, to affect the offspring throughout their lives.

Old models emphasized the process of *socialization* of anthropoid infants, assuming that the young were relatively passive in their gradual conformance to adult rules and practices. The latest research shows that anthropoid infants are, instead, highly active partners in social interactions with their family members and groupmates. Infants do far more than passively absorb lessons from their elders, as we will see by looking at their developing relationships with others. All anthropoid infants exhibit immense curiosity and seem driven to explore and to play—sometimes in surprisingly imaginative ways.

Outline

- I. The most important relationship in any monkey's or ape's life is the intense mother-infant relationship, which often lasts for many years.
 - A. Anthropoid infants are born relatively undeveloped compared to most mammals but are able to cling to the mother's fur right away.
 1. Infants first travel ventrally, on the mother's belly.
 2. As infants develop, they become able to ride dorsally on the mother, jockey-style on her back.
 3. Anthropoid infants are rarely apart from their mothers in the early weeks and months, except in certain species where *infant sharing* is practiced.
 - B. The infant's social world only gradually broadens and extends out from the mother.
 1. Initially, the infant's social companions are the mother's social companions, because the infant is so close at all times to the mother.
 2. Gradually, the infant is weaned from the mother's breast.
 3. As weaning proceeds, the youngster's social world begins to include individuals other than the mother's companions.
 4. Peers, as well as other relatives, begin to play a larger role in the infant's social life.
 - C. Sex, age, relative rank, and presence of relatives—the factors discussed in the preceding lecture—help scientists to understand the lives of infants and juveniles just as much as those of adults.
 1. Sex and age intersect to determine whether a youngster will stay in the group into which it is born.
 2. In almost all anthropoids, one sex *disperses* out of its group at puberty.
 - a. One reason for dispersal may be to avoid mating with relatives.
 - b. A second reason for dispersal may be to increase access to necessary resources.
 3. The period of dispersal may be both dangerous and traumatic for the young animal that has to leave.
 4. The dispersing monkey's or ape's life changes dramatically, particularly as regards its rank and the presence of relatives.
- II. The mother-infant relationship—like all subsequent relationships—is best characterized as jointly active and dynamic.
 - A. The traditional way of looking at anthropoid development has been to think of the infant as relatively passive.
 1. The infant is seen as absorbing lessons from its mother, other relatives, and older associates.
 2. Thus the emphasis is on *socialization*, in which the infant slowly becomes transformed into a mature group member through the guidance of older group members.

- B. Newer research emphasizes instead the active, dynamic infant.
 - 1. In this view, the infant is seen, right from birth, to participate jointly with the mother and other associates in shaping its own social world.
 - 2. The emphasis here is on the infant as active and able to alter the course of social interaction in which it participates.
 - 3. Recent research in the wild and captivity illustrates what active, dynamic infants can do.
 - a. Infant baboons of Kenya are active in finding out what foods to eat and how to prepare them.
 - b. Great ape infants living in captivity engage in joint action with their family members as they increasingly coordinate their own needs and desires with those of the family as a whole.
- III. As anthropoid infants, especially great ape infants, grow and develop away from their mothers, they show increasing signs of curiosity and imagination, sometimes in surprisingly sophisticated ways.
 - A. Play with social partners and exploration of the surrounding environment are basic, often-seen processes that aid anthropoid infants and juveniles in the developmental journey away from their mothers.
 - B. More rarely, certain anthropoid infants engage in behaviors that indicate to many scientists that they are capable of surprisingly sophisticated play.
 - 1. Captive great ape infants may play games with each other that indicate they are using their imaginations.
 - 2. A recent observation of an African chimpanzee youngster suggests the youngster invented a “doll” to keep itself company.
- IV. Some anthropoid infants may stay emotionally close to their mothers their entire lives; others may be physically apart from their mothers but nonetheless remain affected by their maternal upbringing.
 - A. Different mothers have different maternal “styles” that may affect their infants’ own lives.
 - B. Some mothers are restrictive and vastly constrain their infants during development.
 - C. Other mothers are more relaxed and allow their infants to explore more widely from a young age.
 - D. Just as they do in humans, different maternal personalities will affect offspring in different ways as they grow to mature males and females.

Essential Reading:

King, *The Information Continuum*, chapter 2.

Supplementary Reading:

Altmann, *Baboon Mothers and Infants*.

Questions to Consider:

- 1. Knowing about both the emotional capacity of monkeys and apes and the intensity of the anthropoid mother-infant bond, speculate about any emotions that might be involved in the process of dispersal at puberty.
- 2. What do you think of arguing against the use of day care in American society by citing the importance of the intense mother-infant bond in monkeys and apes?

Lecture Four

Males and Females: Really So Different?

Scope: Popular views paint monkey and ape males as dominant, able to boss females around, and aggressive, willing to do so with enthusiasm. Females, by contrast, are said to be coy and peaceful, concerned largely with motherhood. To the extent that human males and females are different, then, sex differences are seen to be at least partially inherited.

In this lecture, we review data that bear on this view. First, we consider the basic variation across anthropoid species in how males and females conduct themselves, showing that the old stereotypes are inaccurate. We then zoom in for a close-up analysis of male-female differences in the four great apes.

Males of three great ape species, chimpanzees, gorillas, and orangutans, do tend to act quite aggressively under certain circumstances, especially toward females. Yet to varying degrees, these males are concerned with cooperation and peace making, as well as with dominance and aggression. Further, the picture derived from study of the fourth great ape, the bonobo, is quite different. Males are not often aggressive. Females bond with one another, at times dominating males and often sharing with them equal access to resources. Male-female differences do occur in our closest living relatives, but these vary according to social environment and social circumstance rather than in any rigid and predictable way.

Outline

- I. Popular writings and films about anthropoids tend to emphasize the notion of dramatic sex differences. Females and males are portrayed as very different from each other.
 - A. Female monkeys and apes tend to be depicted as relatively passive, peace-loving creatures.
 1. Females are “tied up in reproduction,” that is, in carrying, giving birth to, and nursing babies. First and foremost, they are mothers.
 2. “Bossed around” by the males in their groups, females have little power.
 - B. By contrast, male monkeys and apes tend to be depicted as active and powerful.
 1. Males use aggression to increase their own chances of reproduction but are free from constraints of parenthood and can devote themselves to power struggles.
 2. Males universally strive to increase their relative ranking in the group and aggress against other males and females toward this goal.
 - C. Given the notion of humans’ biocultural nature, a question naturally emerged from this view: Are human sex differences inherited? Are women “made to be” stay-at-home mothers while males are “made to be” more dominant and powerful?
- II. Forty years ago, this popular stereotyping by sex also characterized scientific literature on monkey and ape behavior. Females were studied as mothers, and males were studied as leaders around whom social groups cohered. We now know otherwise!
 - A. Females, too, spend time and energy striving for higher rank in their groups. In certain species, they may outrank males, and in many circumstances, they may band together to protect themselves against males. Motherhood does not preclude an interest in power.
 - B. Males may be aggressive in some situations but not at all in others. Degree of aggressiveness may differ greatly across individuals.
 - C. Given this variation across species and circumstances, scientists are reluctant to draw conclusions about sex differences in humans from judging their anthropoid relations.
 - D. Studying the variation among the four great apes has proven particularly enlightening in understanding male-female differences.
 - E. For decades, only three great apes were well studied. Information from all three supported the notion of males as more dominant and aggressive than females.
 1. Orangutan and gorilla males are twice the size of females and, as a result, may carry out various types of violent behavior against females.

2. Chimpanzee males are not much larger than chimpanzee females. Males, however, bond together in chimpanzee groups and may collectively carry out violent behavior against females.
 3. Theories of the evolution of human behavior emphasized the “common pattern” in our closest living relatives, suggesting that male violence toward women might be evolutionarily ingrained.
- F. More recently, the fourth great ape, the bonobo, has been studied, with conclusions of a different nature.
1. Male bonobos are neither much larger than females, nor band together collectively to the exclusion of females. Male-to-female violent behavior is essentially absent in bonobos.
 2. Female bonobos do have strong social bonds and will group together against males. Dominance is often shared among males and females in this species, with peaceful coexistence the result. Female resistance should not be overlooked in any great ape.
 3. Bonobos are equally closely related to humans, as are chimpanzees. Theories of the evolution of human behavior can no longer point to a “common pattern” in our closest living relatives.
- III. Biological anthropologists conclude that arguing for “a female nature” or “a male nature” is inaccurate based on the behavior of our closest anthropoid relatives.

Essential Reading:

de Waal and Lanting, *Bonobo: The Forgotten Ape*, chapter 3.

Wrangham and Peterson, *Demonic Males*.

Supplementary Reading:

Kano, *The Last Ape*.

de Waal, *Good-Natured*.

Questions to Consider:

1. Can you think of any reasons why the American scientific view of female monkeys and apes as passive mothers began to change only in the late 1960s–1970s?
2. What impact do you think the scientific study of female behavior and power in bonobos might have on theories of inherited human aggression?

Lecture Five

Sex and Reproduction

Scope: Typically, we think of animal sexual behavior as tightly linked to reproduction. That is, we expect animals to mate in order to produce young. And, of course, they do so! Yet we know that in humans, sexual behavior may occur outside the context of reproduction. Recent research shows that the same phenomenon occurs in some anthropoids.

Male and female anthropoids have, by virtue of differing reproductive life histories, different “best strategies” for how they can mate and produce offspring. But this idea doesn’t translate to males acting as “Don Juans” and females acting with relative indifference toward sexual activity. Nor does it indicate that human females should differ in some predictable way from human males in terms of reproductive behavior. We will investigate field research showing that in certain monkeys and apes, both males and females may mate far more often than is necessary to ensure reproduction and may mate with individuals who are unable to bear offspring.

Once again, as in the last lecture, bonobos make an especially vital case study. Bonobos display unusually high rates of sex for reasons other than reproduction.

Outline

- I. As we saw in the last lecture, despite clichés about sex differences, male-female differences in monkeys and apes may not be so pronounced after all in terms of power and dominance. Are there similar sets of stereotypical views about male-female differences in the areas of sex and reproduction?
 - A. Female monkeys and apes are portrayed as sexually coy. Coy females seek the best fathers for their infants but, beyond that, are relatively uninterested in sex.
 - B. Male monkeys and apes are portrayed as “Don Juan” types, always eager to engage in sexual behavior well beyond what is needed to father infants.
- II. Male and female anthropoids do have different interests and strategies when it comes to reproduction, that is, to ensuring that they produce healthy offspring.
 - A. Females can carry, bear, and nurse only so many infants during the course of their lifetimes. Their reproductive output is quite limited because their contributions to rearing young are so prolonged and intense.
 1. Great ape females may live into their forties (but often do not survive that long).
 2. Great ape females nurse each infant at least four years and produce a new infant every four to eight years (depending on the species).
 3. Producing seven or eight surviving offspring in a lifetime is probably the maximum for a great ape female.
 - B. Males, because they often contribute little beyond the time of conception, may sire many offspring during their lifetimes.
 1. Great ape males rarely contribute intensively to infant care and protection.
 2. It is harder to estimate how many offspring are produced by males, because paternity is rarely known in great ape populations. The theoretical maximum for males is much higher than that for female.
 - C. Females thus bear a much higher “cost” per each infant than do males and should choose mating partners wisely to protect their investment in their own offspring.
- III. Male and female anthropoids do not, however, differ as widely concerning *sexual*, as opposed to *reproductive*, behavior as might be predicted.
 - A. Female monkeys and apes spend time and energy on sexual behavior in excess of what is strictly needed for reproduction.
 1. Females in certain populations are known to mate frequently and sometimes with more than one male. This level of sexual activity exceeds what is needed to ensure conception.

2. Recent studies suggest some females may “sneak” outside their groups to mate with strange males, but some of these data are still in dispute.
- B. High rates of sexual behavior by males may occur during specific periods of the male life cycle rather than frequently at all periods of a male’s life.
 1. Males may enjoy the highest mating success when they first enter a new group or at other brief periods in their lives.
 2. Female choice of mating partners, not just male behavior itself, greatly influences male mating success.
- IV. That sexual behavior and reproductive behavior are not always equivalent can best be understood through case studies of wild bonobos living in Africa and in captivity.
 - A. Nonreproductive sex (sex not tightly linked to conceiving infants) is prevalent in bonobos.
 - B. Sexual behavior occurs outside the typical adult female-adult male context and includes same-sex behaviors.
 - C. Bonobos may lead us to ask questions about sexual behavior in other anthropoids that have not been pursued widely to date.
- V. Owing to the great variation in monkey and ape behavior that we have just reviewed, biological anthropologists conclude that it is dangerous to draw conclusions about human sex differences based on what monkeys and apes do.

Essential Reading:

de Waal and Lanting, *Bonobo: The Forgotten Ape*, chapter 4.

Hrdy, *The Woman That Never Evolved*.

Supplementary Reading:

Smuts, *Sex and Friendship in Baboons*.

Questions to Consider:

1. What in your view is the best evidence that sex and reproduction are not synonymous in anthropoids?
2. Speculate about whether the nonaggressive behavior and the hypersexual behavior of bonobos might be linked and, if so, how?

Lecture Six

Tool Making: Of Hammers and Anvils

Scope: Tools, whether simple forks and toothbrushes or the most complex telescopes, rockets, and computers, are a critical part of the human way of life. We constantly make and use tools to solve problems, both in our everyday lives and in scientific ventures. Until forty years ago, making and using tools was thought to be uniquely human. Startling observations by Jane Goodall of wild chimpanzees making “fishing tools” to capture and eat termites changed that view forever.

We will consider three main conclusions stemming from investigation of anthropoid tool use over the last four decades since Goodall’s discovery. First, wild chimpanzees routinely make and use an incredible variety of tools, far more than any other nonhuman animal. They exceed what monkeys, living in the same areas of Africa, can do with tools. The nut-cracking behavior of West African chimpanzees is an especially complex example. Second, recent discoveries point to regular tool making and use by a few other anthropoids—primarily the orangutan—in the wild and to more widespread tool use than expected in captivity. Third, anthropoid tool using and tool making is clearly a learned skill rather than an instinct.

Outline

- I. Think back to your most recent meal: Did you prepare or consume it with tools of some sort? Perhaps you used cooking ware or a microwave oven to ready your food and silverware to aid in eating it. You may even have located recipes or restaurants using a computer before the meal. Tool use is a routine part of our lives.
 - A. Until the early 1960s, anthropologists believed that humans were the only anthropoids to make and use tools under natural circumstances.
 - B. After observing chimpanzees in Africa, Jane Goodall realized that these great apes not only use tools to solve problems, but they also make tools to suit their needs.
 - C. Chimpanzees solve problems with tools in ways that monkeys in the very same part of Africa do not.
 1. Chimpanzees enjoy eating termites. They will make and use “fishing tools” to extract termites from mounds, allowing year-round consumption of this protein resource.
 2. Baboons also enjoy eating termites. Despite having observed chimpanzees “fish” for termites, however, no baboon has ever been observed to make or use a tool to extract the termites. Baboons wait for termites to fly out.
- II. Chimpanzees are second only to humans as accomplished, persistent tool users and tool makers in the animal kingdom.
 - A. Chimpanzees use tools in different contexts, including grooming, aggression, feeding, and drinking.
 - B. Modification of tools is performed by chimpanzees in flexible ways, with tools tailored to the task at hand.
 - C. Nut cracking carried out by chimpanzees at Tai on the Ivory Coast (and in other areas of West Africa) is probably the most complex example of tool using by any nonhuman anthropoid.
 1. Hammers used to crack nuts may be of stone as well as wood. Stone tool use is rare in nonhumans.
 2. The technique of nut cracking is complex, involving multiple tools and precise movements.
 3. The technique emerges gradually, with youngsters making many mistakes as they learn.
 4. Guidance and teaching by adults to youngsters is occasionally seen in nut cracking.
 5. Foresight and planning can be seen in the behaviors related to nut cracking in West African forests.
- III. For many years, tool use by anthropoids other than chimpanzees was thought to be very limited.
 - A. Capuchin monkeys of Central and South America use tools to solve some problems, but their tool-using abilities seem more limited than those of chimpanzees.
 - B. Great apes other than chimpanzees are highly skilled at tool use in zoos and laboratories. Some great apes who are zoo residents have developed reputations as tool-wielding escape artists!

- IV. In the 1990s, a population of orangutans in Asia was discovered to use and make tools in a way reminiscent of what chimpanzees do.
- A. Orangutans in one area of Sumatra make and use tools in obtaining fruit, honey, and insects.
 - B. The high social tolerance among orangutans in this area of Sumatra appears critical to their tool-using customs. These orangutans are more social than non-tool-using orangutans.
 - C. By looking for patterns in what tool-using chimpanzees and orangutans do in the wild, we may begin to understand why tool use and tool making evolved in anthropoids.
- V. Use of human technology is firmly grounded on a foundation of tool using and tool making by our closest living relatives.

Essential Reading:

Boesch and Boesch-Achermann, *The Chimpanzees of Tai Forest*.

McGrew, *Chimpanzee Material Culture*.

Supplementary Reading:

Parker et al., *The Mentalities of Gorillas and Orangutans*, chapter by Fox et al.

Linden, *The Parrot's Lament*, chapter entitled "Orangutan Engineers and Nut-Cracking Chimps."

Questions to Consider:

1. What evidence suggests that tool using and tool making behaviors are not instinctual, but rather learned, in anthropoids?
2. What are some implications of the fact that wild orangutans were studied for thirty years before regular patterns of tool using and tool making were discovered?

Lecture Seven

Social Learning and Teaching

Scope: Knowing that some anthropoids learn how to make tools from one another, we now consider a broader question. Do monkeys and apes learn a variety of survival and social skills from one another, as humans do? Or do they instead discover skills more often on their own, through trial-and-error experimentation?

We first address this question through a case study of how baboon infants in Kenya learn skills related to foraging. That is, we follow along as a field researcher living in a Kenyan national park investigates how baboon youngsters come to know the right foods to eat and how to eat them. The baboon infants profiled are skilled information gatherers, behaving in ways that increase their chances of learning even when their parents or other adults do not guide or teach them. This information gathering on the part of youngsters is typical for anthropoids.

Yet as we broaden our investigation, we discover that in a few cases—including the nut-cracking chimpanzees of West Africa—adults do “donate” information to their infants through active guidance and teaching. We will consider factors that help explain these different patterns of learning and teaching in different anthropoids.

Outline

- I. As we have seen, chimpanzees learn how to use tools appropriately in a gradual manner, at times guided by teachers. The extent to which monkeys and apes engage in social learning and teaching in all areas of life is currently open to question.
 - A. When learning is observed to occur by monkeys and apes, can scientists tell if it is social in nature? That is, is it possible to know when learning comes about because of interaction with social companions?
 - B. By contrast, when is learning the result of nonsocial trial-and-error practice and discovery?
 - C. Might some monkeys and apes teach as well as learn?
 - D. Do differences relating to social learning and teaching behaviors occur in monkeys versus great apes?
- II. Two case studies concerning social learning and teaching, both done in the wild but one on monkeys and the other on great apes, might help shed light on this debate.
 - A. The first study involves infant baboons living in Amboseli National Park, Kenya, and how they learn what foods to eat and how to prepare those foods (that is, solving “feeding problems in the wild”).
 1. This study shows how challenging it is for scientists to tease apart social and independent learning unless the infants are followed around the clock without interruption.
 2. We can observe, however, that baboon infants make use of their more experienced social companions in confronting their feeding-related problems.
 - a. Infants feed on the same types of foods as their older companions do, at the same time.
 - b. Infants sniff muzzles of their older companions when those animals are feeding.
 - c. Infants scrounge scraps of food from their feeding older companions.
 3. Adult baboons do not guide or teach the infants in food choice or food preparation; rather, it is up to the infants to figure out solutions to these feeding problems.
 - B. The second case study involves nut-cracking chimpanzees from Tai, Ivory Coast (whom we met in the last lecture). As opposed to Amboseli baboons, these chimpanzees rely on adult guidance, in addition to infant social attention, as they learn tool-using techniques.
 1. Infants attend closely to what mothers and other elders do while nut cracking.
 2. Infants beg for nuts from their mothers, who donate food to them and thus “underwrite” their learning period.
 3. Adults donate guidance and teaching, as well as foods, to infants during the tool-using apprenticeship period.

III. Amboseli baboons and Tai chimpanzees show some patterns in common but also show some dissimilar patterns.

- A.** Both case studies, with baboons and chimpanzees, should be understood to involve dynamic interchanges.
 - 1.** Skills are not “acquired” through learning or teaching as a piece of food can be acquired. Skills are not “transmitted” from one to another.
 - 2.** Instead, skills emerge through social interaction. Both learning and teaching involve joint participation through social interaction.
- B.** Some great apes may rely on dynamic guidance and teaching more than is typical for most anthropoids, as the Tai chimpanzees illustrate.
- C.** Conclusions about social learning and teaching are preliminary and will require much more work. Because the debates about social learning and teaching are intimately tied to the question of culture, they are central to our understanding of the roots of human behavior.

Essential Reading:

Byrne, *The Thinking Ape*.

King, *The Information Continuum*, chapter 3.

Supplementary Reading:

Parker et al., *The Mentalities of Orangutans and Gorillas*, chapter by Whiten.

Questions to Consider:

- 1.** What is advantageous about social learning over independent learning, and are there any potential drawbacks to social learning in certain circumstances?
- 2.** Can you think of any instances of learning or teaching in your own life that can be described as interactive and dynamic in the senses used here?

Lecture Eight

Culture: What Is It? Who's Got It?

Scope: A hot topic currently in biological anthropology is whether culture is unique to humans or shared with other animals. This debate is complicated by the inability of scholars to agree on what *culture* is in the first place! We will consider four major points of view. In the first, culture is equated with social learning. In this case, not only many anthropoids, but many other mammals as well, have culture. A second view is that to count as culture, social learning must be group specific; that is, it must occur in certain social groups but not others and for reasons divorced from ecological differences. Chimpanzees qualify for culture under this definition.

Yet another view is that culture must include not only social learning but also the use of symbols that “stand for” other objects in a creature’s world. Given this definition, inclusion of anthropoids in the cultural realm is debatable. A fourth alternative is that culture is about the transmission of complex ideas and beliefs, for example, about spirituality or religion, and is, therefore, uniquely human.

We may conclude that, under at least some definitions of culture, chimpanzees are good candidates for *culture bearers*, and other anthropoids, such as Japanese macaques, may also qualify.

Outline

- I. No concept other than culture has been more central, historically, to the discipline of anthropology. The concept is defined, however, in hundreds of different ways even within this one discipline.
 - A. Culture may be equated with social learning. In this view, whenever learning takes place socially, in any of the ways we explored in the last lecture, culture is present.
 - B. Culture may also be defined as group-specific patterns that are learned socially. Here, only social patterns that are learned and that differ across groups are counted.
 - C. Alternatively, not just social learning but symbolic representation may be seen as a necessary condition to invoke culture. That is, culture bearers must be able to represent objects or ideas with symbols that “stand in” for the real item.
 - D. Culture may also be considered limited to the transmission of complex ideas and beliefs, as in those that make up religion and multilayered social institutions.
- II. Whether monkeys or apes might be thought to have culture depends entirely on what evidence is admitted as relevant to one’s definition of *culture*.
 - A. If culture is social learning of any type, monkeys and apes have culture.
 1. Tai nut-cracking chimpanzees are secure candidates for having culture under this definition.
 2. Japanese macaques who copy patterns of feeding from social companions are likely candidates for culture under this definition.
 - a. A famous Japanese macaque called Imo was observed to invent new feeding techniques.
 - b. Soon, her relatives and close associates began to use the same new feeding techniques.
 - c. Gradually, the techniques spread through the monkey group.
 - d. Some scientists believe the new techniques were imitated and are proof of monkey culture.
 - e. A few skeptics suggest that the new techniques came about through means other than social learning and do not accept this instance of monkey culture.
 - B. If group-specific patterns are required for culture, chimpanzees definitely have culture.
 1. Tool-using patterns differ markedly across chimpanzee populations and are the result of social learning rather than differences in the environment.
 2. In 1999, a seminal paper was published suggesting multiple cultural patterns in chimpanzees, involving tool use and other behaviors.
 - C. If symbolic representation is needed for culture, a very few candidates for culture from great ape populations may exist. These data are, however, still arguable.

1. Chimpanzees may use the behavior of leaf clipping to mean different things in different populations. The behavior would then be symbolic.
 2. Bonobos may mark their paths and changes in travel direction with trail markers. Such trail markers may be symbolic.
- D. No monkey or ape groups are built on a foundation of complex ideas and beliefs as far as we know. Under this definition, culture is denied to nonhumans.
- E. Looking at how all anthropoid youngsters learn how to participate in their social worlds, not only through group-specific patterns of tool use but in a broader sense, may help biological anthropologists understand culture better.
- III. Most biological anthropologists agree that we can best understand human culture by looking at the foundations of culture in our closest living relatives.

Essential Reading:

de Waal, *The Ape and the Sushi Master*.

Whiten et al., *Cultures in Chimpanzees*.

Supplementary Reading:

Bonner, *The Evolution of Culture in Animals*.

Questions to Consider:

1. Which of the several possible definitions of culture do you prefer? Why?
2. What is the best evidence (if any) to support the claim that monkeys and apes have culture, according to the definition of culture that you prefer?

Lecture Nine

Dynamics of Social Communication

Scope: At this point in the course, we have thoroughly reviewed the information indicating that anthropoids are both thinking and feeling creatures. They behave in flexible ways closely attuned to their physical and social environments. But do they communicate their knowledge and desires to each other? If so, how?

This lecture focuses on the natural communication of monkeys and apes and highlights two points emerging from recent research. First, referential communication occurs in some anthropoids. That is, monkeys and apes may communicate in specific ways about the external environment. Referential communication goes beyond the communicating of mere emotions. A good example comes from the alarm calls made by vervet monkeys of Kenya to distinguish, in a referential way, among various types of potential predators.

Second, the communication of monkeys and apes takes on significance and meaning during social interaction. That is, as we will see through a case study of the emerging gestural skills of infant African apes, meaning is created through social interaction in apes just as it is in humans.

Outline

- I.** The roots of social learning, tool use, and culture in humans can be seen in the behaviors of other anthropoids. But what about the roots of language? Are they to be found in the patterns of social communication of other anthropoids? Or is human language unique in the animal world?
 - A.** A long-held view was that monkeys and apes communicate to each other only their own arousal or emotional states (e.g., hunger or fear).
 1. Emotional communication precludes message sending about specific aspects of the environment.
 2. Emotional communication is outside the control of the communicator; it is akin to a reflexive response.
 3. Human language is much more complex than emotional communication; therefore, human language is a unique system among anthropoids.
 - B.** An updated view shows that under certain circumstances, monkeys and apes may go beyond emotional communication to referential communication.
 1. Referential communication involves the ability to communicate specific information about certain aspects of the environment.
 2. Referential communication may occur together with emotional communication and may be under the voluntary control of the communicator.
 3. Referential communication and human language may be alike in certain major ways. Whether the roots of human language are in referential communication is an open question.
- II.** The first compelling case to be made for referential communication in monkeys and apes came from a study of vervet monkey alarm calling in Kenya.
 - A.** Experimental work with wild vervets showed that the monkeys make specific calls for specific predators, rather than one fearful alarm call signaling their arousal state.
 - B.** The system of predator-specific alarm calls emerges gradually during infancy, indicating some type of learning.
 - C.** Since the vervet work, other examples of referential communication have been discovered.
- III.** When gestures are studied in addition to vocalizations, we get a fuller picture of social communication in all anthropoids.
 - A.** Great apes may rely quite heavily on gestures in their patterns of social communication.
 1. Basic arm and head gestures may be used in various contexts to request food sharing, grooming, mating, or play.
 2. Iconic gestures may also occur, in which the gesturer indicates through movements to a social partner exactly what he or she desires be done.

B. Analysis of gestural communication shows that social communication is a dynamic process that unfolds between jointly acting partners.

1. A dynamic process means that the gestures are not important in themselves but only as they emerge from and help coordinate the “dance” of behavior between social partners.
2. Because gestures are visible, we can see dynamic patterns easily, but this process should be studied in vocal communication as well.

IV. Human language is unique in its complexity, but its roots can be found in the dynamic social communication of other anthropoids.

Essential Reading:

Cheney and Seyfarth, *How Monkeys See the World*, chapters 4–5.

King, *The Origins of Language*, chapters 2–4 and 9.

Supplementary Reading:

Parker et al., *The Mentalities of Gorillas and Orangutans*, chapter by Tanner and Byrne.

Questions to Consider:

1. Why was the discovery of predator-specific alarm calls in vervet monkeys so revolutionary to the understanding of anthropoid communication?
2. Why do you think the study of anthropoid gestures has been so neglected compared to the study of anthropoid vocalizations?

Lecture Ten

Do Great Apes Use Language?

Scope: As we continue to analyze anthropoid communication, we meet a very special type of anthropoid, the enculturated great apes. These apes, raised in enriched environments, are able to use and comprehend symbols in communication with humans. We discuss, first, individual great apes who are trained to use aspects of American Sign Language, including Washoe the chimpanzee, Koko the gorilla, and Chantek the orangutan. We review their accomplishments in terms of vocabulary and creative production but note that these accomplishments are not universally accepted as valid.

Next, we look at the accomplishments of Kanzi, a bonobo proficient at using lexigram symbols on a keyboard and at comprehending spoken English. The Kanzi project is considered by many—but by no means all—scientists as especially successful, because Kanzi was not trained to use symbols, but rather picked up the ability by watching training regimes used with his mother.

We consider the relationship between the abilities of enculturated great apes, nurtured by humans in captive settings, and the spontaneous abilities of wild monkeys and apes discussed in the previous lecture. Looking at both types of communication abilities together, we can ask: How is human language similar to, and different from, the communication of monkeys and apes?

Outline

- I. A fascinating window into the minds of other anthropoids is available through research into the language abilities of enculturated great apes.
 - A. Enculturated great apes are those raised in enriched captive environments.
 - 1. These great apes have extensive interactions with human caretakers.
 - 2. Such objects as toys and tools play an important role in the lives of enculturated great apes.
 - B. Language abilities of these great apes are explored in multiple ways.
 - 1. Enculturated great apes are usually exposed to human speech, gestures, and human-devised symbol systems.
 - 2. The symbol systems used may involve a version of American Sign Language or, alternatively, a symbolic language devised specifically for testing great apes.
- II. Three research projects illustrate what happens when a version of American Sign Language (ASL) is taught to great apes.
 - A. These projects involve individual researchers raising great apes from infancy while tutoring them in ASL.
 - 1. Washoe, a female chimpanzee, has been reared using a version of ASL.
 - 2. Koko, a female gorilla, has been similarly raised using ASL.
 - 3. A male orangutan named Chantek has been tutored in ASL in a similar manner.
 - B. All three great apes achieved a good-sized vocabulary of ASL signs.
 - C. All three ASL pupils are able to use signs in creative and innovative ways, not just to receive a reward when asked questions.
 - D. The focus of study has been great-ape-to-human language abilities, but the Washoe project does show that great apes will use ASL in communicating with each other.
 - E. Debate exists about the meaning of the data from these three projects and what role human teaching played in the great apes' success.
 - 1. Critics claim that the researchers read too much into the great apes' linguistic abilities.
 - 2. The researchers respond that the critics hold a double standard for evaluating the linguistic abilities of enculturated great apes and human children.
- III. A fourth research project has chronicled what happens when a very different symbol system is used with a male bonobo.
 - A. Bonobos at a research center in Georgia were being tutored with lexigrams, abstract symbols arrayed on various computer boards.

- B. Infant bonobo Kanzi *spontaneously* began to use lexigrams after attempts to teach them to his mother had failed.
 - C. Kanzi quickly excelled in production and comprehension of symbols.
 - 1. Kanzi produces lexigram utterances in novel and interesting ways.
 - 2. Kanzi comprehends novel requests in spoken English.
 - D. Work with Kanzi is widely considered the most convincing demonstration of language abilities in nonhuman anthropoids.
 - 1. The Kanzi project shows that training is not necessary for linguistic skills to emerge in great apes.
 - 2. This project suggests that the rearing environment is critically important for fostering linguistic skills in infant anthropoids.
 - E. Results of this research are, however, still hotly debated.
 - 1. Critics say that even if Kanzi has not been trained, his human caretakers “caused” the language abilities to emerge.
 - 2. Defenders point out that human caretakers surround human children who are learning language.
 - 3. Defenders note that the Kanzi project shows that the rearing environment is just as critical a variable as is species membership (human versus great ape) in learning a language.
- IV. Taken together, the abilities of monkeys and apes in social communication and language shed light on the roots of human language.
- A. Just as with other behaviors we have considered, language does not seem to be “present” in humans and “absent” in all other anthropoids.
 - B. Human language and social communication of monkeys and apes both serve to coordinate social behaviors.
 - C. Human language and social communication of monkeys and apes may involve quite specific environmental references rather than only emotional communication.
 - D. Human language and social communication of monkeys and apes arises through interaction during infant and juvenile development.
 - E. Human language is a very specific type of social communication that involves symbols arranged into sentences.
 - F. Human language, much more than the social communication of monkeys and apes, allows us to talk about the past and the present.

Essential Reading:

Fouts, *Next of Kin*.

Savage-Rumbaugh and Lewin, *Kanzi*.

Supplementary Reading:

Wallmann, *Aping Language*.

Questions to Consider:

1. Why do you think the Kanzi project has been (in the opinion of many) so successful in uncovering the language skills of a great ape?
2. What are the most important ways, in your view, that human language differs from the language skills of enculturated great apes?

Lecture Eleven

Highlights of Human Evolution

Scope: Throughout the course, emphasis has been placed on the African great apes as humans' closest living relatives in the animal world. Yet biological anthropology, when studying humans as biocultural beings, also considers the hominids, the modern humans and their extinct relatives.

First appearing in Africa over four million years ago, the early hominids, such as the famous "Lucy," were creatures quite anatomically different than apes. They were bipedal. Over time, hominids slowly and gradually developed more sophisticated technology, migrated out of Africa, and eventually mastered the control of fire, big game hunting, and art. For the great majority of this period of human evolution, multiple hominid forms coexisted on earth.

By about thirty thousand years ago, modern human beings had outcompeted and replaced all other hominids. This lecture serves as a survey to highlight only a few of the major developments in hominid prehistory, to aid in our understanding of our most recent anthropoid roots.

Outline

- I. The grouping called *anthropoids* includes a type of primate we have not yet discussed in any depth, the hominids.
 - A. The hominids include all living humans, classified as *Homo sapiens*, and all extinct human ancestors.
 - B. Hominids first appeared in the fossil record between four and five million years ago in Africa.
 1. These first hominids evolved from a common ancestor with great apes, as noted in our first lecture.
 2. Early hominids are noted especially for their bipedalism, a distinguishing feature setting them apart from the common ancestor and from the great apes alive at that time.
 - C. Various types of hominids coexisted throughout the time period of four million years ago through about thirty thousand years ago.
 1. We now understand the process of human evolution to resemble a bush rather than a ladder. Multiple coexisting forms were the rule, rather than the idea that one form "succeeded" another in straightforward fashion.
 2. The situation we take for granted today, being the sole hominid species alive in the world, was unheard of during the entire time period of human evolution through thirty thousand years ago.
- II. We know more about the anatomy than the social behavior of the hominids for about the first two million years of their existence.
 - A. Two anatomically different types of early hominids have been discovered.
 1. Both forms were bipedal and small brained.
 2. The so-called *gracile* forms were lighter in build and generalized skeletally.
 3. The so-called *robust* forms were heavier in build with more specializations of the head and face.
 4. Gracile and robust forms ate very different diets; this dietary divergence explains their different anatomies.
 - B. One of the gracile forms is the famous hominid "Lucy."
 1. Lucy and her kind lived in Africa between three and four million years ago.
 2. The correct scientific name for the hominid of which Lucy is an example is *Australopithecus afarensis*.
 3. We know a great deal about Lucy's anatomy. She is bipedal without a doubt, but the nature of her bipedalism is debated.
 - a. Some anthropologists think that Lucy walked in a fully modern way.
 - b. Others believe she used the trees instead of just walking on the ground in a modern way.
 - c. Fossilized footprints found at an African site and dated to 3.6 million years ago may shed some light on the debate about Lucy's bipedalism.
 4. We know little about Lucy's behavior.

- a. No fossilized stone tools are associated with Lucy. Anthropologists conclude that this hominid likely used tools in the ways that modern chimpanzees do.
 - b. We have no way of knowing what types of social groups this hominid lived in. We can only speculate.
- III. A turning point occurred in human evolution around 2.5 million years ago.
 - A. At about this time, hominids that are more like modern humans than Lucy's kind and are classified as *Homo* appeared.
 - B. Anatomical changes did mark the *Homo* genus off from the earlier hominids, but more important was the advent of stone tool technology.
 - 1. Modified stone tools are found at this time.
 - 2. These stone tools indicate a heightened ability to alter the physical environment in which hominids lived.
- IV. Another turning point occurred with a later hominid called *Homo erectus*.
 - A. *Homo erectus* left Africa to colonize other continents.
 - B. Major developments in technology occurred with this hominid.
 - C. Many anthropologists think that big game hunting and the control of fire first occurred with *Homo erectus*.
- V. Other species of *Homo* also evolved in later human evolution; the relationship between these species and our own is not entirely clear. Africa seems to be the birthplace of our own species.
 - A. Most anthropologists think the well-known Neandertals, which did not occur in Africa, are a side branch.
 - B. New discoveries suggest that our very own species is quite young, evolving in Africa only around 125,000 years ago.
 - C. Anthropologists argue about whether certain forms of culture—art, for example—appeared suddenly or gradually in the fossil record.
- VI. Anthropologists work to understand which aspects of behavior found in hominids arose only in the hominid lineage and which were present in the anthropoid lineage before hominids evolved.
 - A. A major conclusion of this course is that many behaviors found in the hominid lineage had their roots in other anthropoids that have already evolved—the monkeys and apes.
 - B. Understanding the period of human evolution gives us perspective on what it means to be *Homo sapiens*. By the same token, only by seeing the entire period in comparative perspective—compared to other anthropoids—can we gain real perspective on the hominids.

Essential Reading:

Park, *Biological Anthropology*, chapters 10–12.

Tattersall, *The Fossil Trail*.

Supplementary Reading:

Johanson and Edey, *Lucy*.

Questions to Consider:

1. What are the implications of the fact that the coexistence of multiple hominids was the rule during human evolution?
2. What do you consider to be the most important uniquely hominid behaviors (that is, behaviors to arise only after the split with the common ancestor)?

Lecture Twelve

Exploring and Conserving a Legacy

Scope: In our concluding lecture, we consolidate major findings gleaned from the biocultural perspective. Our main “take-home” message is that humans are both products of our anthropoid legacy *and* unique biocultural beings. By adding this cross-species dimension to the knowledge base of the other social sciences, anthropology helps us better understand our own place in the world.

We consider two questions that may arise from this perspective: First, might the biocultural framework explored here lead us to any practical understanding of human patterns today? We consider this question through a case study of sleeping patterns of human infants and their caretakers across the globe.

Second, what are the implications of acknowledging our close link with other anthropoids? Many of these creatures are severely endangered in the wild today. Great apes, particularly, are victims of deforestation and the bushmeat trade, in which they are killed and eaten (and sometimes exported) for food. What is our responsibility to these fellow anthropoids and to others living in captivity?

In closing, we emphasize that our primary evolutionary legacy from other anthropoids is not any one particular anatomical trait or behavioral tendency, but rather the ability for *flexible response according to the circumstance at hand*.

Outline

- I. Studying humans as anthropoids, instead of beings unique and separate from the rest of the animal world, helps us understand our past.
 - A. Through the lens of biological anthropology, we see that no strict division exists between monkeys and apes as “biological beings” and humans as “cultural beings.”
 - B. Monkeys and apes show in their behaviors the roots of complex social bonds, emotional ties, culture, language, and technology. Many human behaviors differ in degree more than in kind from the behavior of other anthropoids.
 - C. Modern humans share a legacy of the past with our anthropoid cousins and have built a foundation of culture on this past. Humans are biocultural beings.
- II. Studying humans as anthropoids can also help us understand ourselves now, in the twenty-first century.
 - A. Our long evolutionary history as anthropoids can help us understand and shape our behavior in the modern world, as we can see by revisiting some aspects of anthropoid infancy.
 1. Anthropoid infants are relatively helpless at birth. Their brains and central nervous systems are not well developed.
 2. Anthropoid infants are extremely attached to the mother (or other primary caretaker) for a period of many months or years. In the great apes, infants are wholly dependent on this caretaker for years.
 3. The infant’s social world, at first, *is* the mother (or other primary caretaker) and broadens out from there.
 4. The rearing environment for anthropoid infants helps determine what skills emerge during infant development.
 - B. The “take-home lesson” from understanding anthropoid infancy is a practical one and may be applied, for instance, to family sleeping patterns.
 1. In the United States and some other industrialized countries, the typical pattern is for an infant to be given its own room to sleep in as soon as possible after birth.
 2. Evolutionarily, infants who sleep alone are an anomaly. Anthropoid infants are adapted to co-sleep right against the bodies of their primary caretakers.
 3. Co-sleeping (sharing the same bed or at least sleeping in the same room) is the dominant pattern in human societies around the world today, as it was in the past.
 4. Co-sleeping may have health benefits for infants, because closeness with the primary caretaker’s body and movements may help regulate breathing.

5. Co-sleeping in humans is a biocultural behavior: It has a long evolutionary legacy but occurs only where specific human societies choose to practice it.

III. Learning about the complex behaviors of our closest living relatives leads to questions about how human societies treat monkeys and apes in the twenty-first century.

- A. Many monkeys and apes in the wild are endangered, facing severe threats to their survival.
 1. Most monkeys and apes are forest adapted; logging and other forms of habitat destruction increasingly affect their populations.
 2. The bushmeat trade is rapidly becoming the single greatest threat to great apes.
 - a. Wild animals eaten and exported for food are called *bushmeat*.
 - b. The bushmeat trade in Africa and Asia is intimately linked to issues of habitat destruction and logging.
 - c. The bushmeat trade in Asia and Africa is severely depleting the numbers of great apes remaining in the wild.
 - d. Conservation experts predict that some great apes may be extinct in the wild within only a few decades.
- B. The question of whether highly intelligent and emotional animals, especially the great apes, should be kept in captivity, and under what conditions, is highly debated.
 1. No agreement exists on whether monkeys and apes should be used in biomedical research, for example, in AIDS research.
 2. Some scientists and legal experts are working toward rights for great apes, whereas others believe that humans should protect them but not bestow rights on them.
- C. We must confront threats to the survival and well-being of monkeys and apes for biological anthropology to continue to learn about the roots of human behavior.

IV. Biological anthropology provides a unique perspective on humanity.

- A. Unlike any other discipline, biological anthropology teaches us about our link with other species, as well as with other cultures and time periods.
- B. The overriding conclusion of this course has several linked parts.
 1. The roots of human behavior are seen in monkeys and apes.
 2. Behavior of monkeys and apes, however, is complex and varied across species, populations, and contexts.
 3. It is a misunderstanding of the idea of *roots of human behavior* to suggest that humans have inherited aggressive tendencies, or linguistic abilities, or any other complex behavior directly from other anthropoids.
 4. Humans have inherited from other anthropoids anatomical traits and behavioral capacities that allow our own unique biocultural profile to emerge.
 5. The most critical trait we have inherited from monkeys and apes is behavioral flexibility, the ability to change our behaviors according to context and circumstances.

Essential Reading:

For more information about the bushmeat crisis, visit www.bushmeat.org.

Primate Information Network's "What's New" feature for updates on the bushmeat crisis and other conservation and behavioral issues can be found at www.primate.wisc.edu.

Small, *Our Babies, Ourselves: How Biology and Culture Shape the Way We Parent*.

Supplementary Reading:

Russon, *Orangutans: Wizards of the Rainforest*.

Wise, *Rattling the Cage*.

Questions to Consider:

1. Why should the way that monkey and ape babies sleep tell us anything about desirable sleeping patterns in modern human households?
2. If great apes were to become extinct in the wild in the next few decades, how would this situation affect both the science of biological anthropology and the everyday lives of people around the world?

Glossary

American Sign Language: Sign language for the deaf in the United States, a modified version of which has been taught to some great apes.

Anthropoid: Means “humanlike”; includes monkey, ape, extinct hominid, and modern living humans.

Anthropology: The comprehensive study of the human species.

Anthropomorphism: The attribution of human characteristics to nonhuman animals.

Apes: The six types of anthropoids united by having longer arms than legs, no tails, and different skeletal design than monkeys. The apes include gibbons and siamangs (lesser apes) and orangutans, gorillas, chimpanzees, and bonobos (the great apes).

Archaeology: The subfield of anthropology that assesses the material culture (artifacts, dwellings, and so on) of past societies.

Biocultural: The intersection of the biological and the cultural as applied to understanding an organism.

Biological anthropology: The subfield of anthropology that analyzes the anatomical and behavioral evolution of humans.

Bipedalism: Walking on two legs.

Bushmeat trade: The practice of killing and eating wild animals, such as monkeys and apes, for food (and sometimes exporting them to other countries for food).

Co-sleeping: Infant human and its caretaker sharing the same bed (or, at a minimum, the same small room).

Cultural anthropology: The subfield of anthropology that studies human customs and beliefs around the globe.

Culture: Historically, the concept most central in anthropology; it may be defined in various ways, including:

1. transmission of information through social learning rather than through the genes
2. group-specific social behavior that is passed along through social learning
3. communication through symbolic representations
4. complex ideas and beliefs that are shared in certain groups.

Dispersal: The process by which anthropoids (usually one sex from any given species) leave their group of birth to mate and live as adults in another group.

Dorsal: On the back.

Enculturated great apes: Those great apes raised by human caretakers in enriched captive environments.

Gracile: Slender, light-boned.

Hominid: Modern humans and their extinct ancestors.

Iconic gestures: Gestures that indicate by their form what is desired (for example, beckoning a companion to come forward toward oneself by moving one’s outstretched arm closer to one’s body).

Lexigram: Abstract symbol devised to test the language skills of some enculturated apes.

Linguistic anthropology: The subfield of anthropology that considers the languages of past and present societies.

Monkey: Anthropoids that are relatively small bodied and less closely related to humans than the apes.

Primates: Type of mammal that includes all the anthropoids and some other organisms as well; all anthropoids are primates, but not all primates are anthropoids.

Referential communication: Communication in which specific aspects of the environment (predators, food, and so on) are referred to.

Robust: Thick, heavy-boned.

Social learning: Learning that proceeds through interaction with social companions rather than through independent discovery alone.

Ventral: On the chest.

Anthropoid Sketches

Note: Scientific names are italicized. The first term in a scientific name refers to the *genus* grouping and the second, to the *species* grouping. When no species term is given, that is because we want to speak broadly about the genus rather than about one particular species.

Australopithecus afarensis. Gracile early hominids of Africa. The most famous example is Lucy, discovered in Ethiopia in 1974. Lucy and others of her type were bipedal hominids with small brains.

Baboons (*Papio*). Many people mistakenly think of baboons as apes, but they are large monkeys found in Africa. We concentrate in this course on the savanna baboon, which lives in large multi-female, multi-male groups. Males transfer at puberty; females tend to be related and closely bonded.

Bonobos (*Pan paniscus*). Great apes found only in the Democratic Republic of the Congo (the former Zaire) in Africa. Bonobos live in multi-female, multi-male communities. Females transfer at puberty; males are related. Social bonds between females and relatively equal status between males and females set this species apart from its close relative the chimpanzee. Bonobos are famous for their frequent and varied sexual behavior.

Capuchins (*Cebus*). Small tree-dwelling monkeys of the New World (Central and South America). Sometimes nicknamed “the ape of the New World,” capuchins are well known for their ability, unusual in monkeys, to make and use tools in the wild.

Chimpanzees (*Pan troglodytes*). Great apes of Africa. Chimpanzees live in multi-male, multi-female communities. Females transfer at puberty, and males are related. Almost no social bonds exist between females, but pronounced bonds among males are found. Males dominate females. Chimpanzees are amazingly flexible tool users and tool makers.

Gibbons and siamangs. Small-bodied lesser ape of Asia. Lesser apes are not as closely related to humans as are the great apes. Gibbons and siamangs spend their time entirely in the trees and tend to live in mated pairs.

Gorillas (*Gorilla gorilla*). Great apes of Africa. Gorillas live in small groups headed by one or two *silverback* males (large dominant males). Once thought to be ferocious and terrifying, gorillas are, in fact, rather calm and placid creatures except in certain rare circumstances.

Homo erectus. The first hominid to migrate out of Africa and to populate other areas of the world. First appearing nearly two million years ago, *Homo erectus* is thought by many scientists to represent a shift point in human evolution. This fossil form is associated with relatively advanced stone tools, control of fire, and possibly, big game hunting.

Homo sapiens. Modern humans; we are *Homo sapiens*. The first indication of modern anatomy appeared about 125,000 years ago in Africa. By 30,000 years ago, all other hominids were extinct except for *Homo sapiens*.

Japanese macaques (*Macaca fuscata*). Monkeys found in Japan. Like savanna baboons, they live in multi-female, multi-male groups with female dispersal and related males. One group of Japanese macaques is famous, because one of its members invented new feeding methods that were then passed along to others, perhaps by social learning.

Neandertals. Hominids that coexisted for long periods of time with *Homo sapiens*, Neandertals bear little resemblance to the stereotypical “cave men” of popular culture. These hominids, probably not modern humans’ direct ancestors, were likely accomplished tool users and hunters.

Orangutans (*Pongo pygmaeus*). The large red great ape of Asia. Entirely tree dwelling, the orangutan lives only on the islands of Sumatra and Borneo. Originally thought to be solitary by nature, orangutans are now known to have important social bonds; one population is becoming famous for its use and manufacture of tools.

Vervet monkeys (*Cercopithecus aethiops*). Small monkeys of Africa. Vervets, like savanna baboons and Japanese macaques, live in multi-male, multi-female groups with female dispersal and related males. Using both the ground and the trees, vervets are quite vulnerable to predators. In biological anthropology, they are famous for having alarm calls that denote specific predator types.

Annotated Bibliography

Essential Reading:

Boesch, Christopher, and Hedwige Boesch-Achermann. *Chimpanzees of the Tai Forest*. Oxford: Oxford University Press, 2000. The most informative, compelling research on chimpanzees, next to Jane Goodall's, has been carried out in the Tai Forest, Ivory Coast. The most relevant chapters in this book explain the complex nut-cracking behaviors of Tai chimpanzees and the implications of those behaviors for understanding chimpanzee intelligence and culture.

Byrne, Richard. *The Thinking Ape*. Oxford: Oxford University Press, 1995. This award-winning book reports and interprets data about the intelligence and social learning strategies of monkeys and apes. At times using technical terms, the volume is clearly written with many vivid examples. A central organizing question is whether apes are more intelligent than monkeys. The title gives a clue to Byrne's answer!

Cheney, Dorothy, and Robert Seyfarth. *How Monkeys See the World*. Chicago: University of Chicago Press, 1990. Already considered a classic, this book by a husband-and-wife team reports in scholarly detail on eleven years of research on vervet monkeys of Kenya. Particularly emphasized are patterns of complex social behavior and intelligence and the now-famous experiments demonstrating that vervets have specific alarm calls for specific predators rather than just emotional cries.

de Waal, Frans. *The Ape and the Sushi Master*. New York: Basic Books, 2001. Is culture a uniquely human trait, or do other anthropoids and, indeed, other animals show evidence of culture? In a book as entertaining as it is informative, de Waal argues for culture in the animal kingdom, equating culture with social learning. His discussion of the assumptions about learning and culture in Japanese primatology, as contrasted to those in Western primatology, is especially effective.

de Waal, Frans, and Frans Lanting. *Bonobo: The Forgotten Ape*. Berkeley: University of California Press, 1997. At first glance a coffee-table book, this volume is actually much more. Through stunning photographs (by Lanting), scholarly summaries (by de Waal), and interviews (with a variety of bonobo experts), we are introduced in a fascinating way to this most recently discovered of all the great apes.

Fouts, Roger. *Next of Kin*. Austin, TX: Bard Books, 1998. In this popular account, Fouts writes movingly of his long-term work with Washoe and other chimpanzees who have been taught a version of American Sign Language. Fouts goes beyond the language work itself to argue that great ape and human minds are very similar and that we can understand these creatures best through caring and empathy—which he makes tragically clear that they often do not receive.

Goodall, Jane. *Through a Window*. Boston: Houghton-Mifflin, 1990. Highly readable, this book tells the story of the Gombe chimpanzees Goodall had studied for three decades (at the time the book was written). Readers meet and come to know individual chimpanzees and their families, with an emphasis on personalities, long-term family ties, and emotions and on Goodall's somewhat unorthodox research methods.

Hrdy, Sarah Blaffer. *The Woman That Never Evolved*. Cambridge: Harvard University Press, 1981 (reprinted 1999). Through Hrdy's analysis, the reproductive and sexual behaviors of anthropoid females are portrayed in their deserved complexity. This book helped to overturn stereotypes of monkey and ape females as so coy and concerned with maternal behavior that they played no active role in sexual behavior or in choosing their own mating partners.

King, Barbara J. *The Information Continuum*. Santa Fe: School of American Research Press, 1994. In this book, I report results of my dissertation work, carried out while living in a Kenyan national park for fourteen months, on how infant baboons learn feeding skills. These data are given in a framework designed to assess how patterns of learning across the generations might have evolved over time in various anthropoids.

———. *The Origins of Language*. Santa Fe: School of American Research Press, 1999. An edited collection, this volume reports the views of scholars who convened for a five-day seminar on language evolution. Our specific target question was "What can monkeys and apes tell us about the origins of language?" Chapters by Maestriperi and Snowdon on monkey communication, by Burling on ape gesture, and by myself on contrasting views of primate communication are most relevant.

McGrew, William C. *Chimpanzee Material Culture*. Cambridge: Cambridge University Press, 1992. McGrew, once a student of Goodall's and now an expert in chimpanzee tool use and culture, clearly explains the complexity and

variation in chimpanzee tool using and tool making across various sites in Africa. As an anthropologist, he is concerned with how chimpanzee material culture might help us understand the evolution of human technology.

Park, Michael Alan. *Biological Anthropology*. Mountain View, CA: Mayfield, 1999 (or latest edition available). Park's is the best of several college-level textbooks to put anthropoid behavior squarely in the context of biological anthropology. Taking a survey approach, Park offers the highlights of primate behavior and hominid evolution, supplemented by superb color photographs, maps, and diagrams.

Rowe, Noel. *The Pictorial Guide to the Living Primates*. East Hampton, NY: Pogonius Press, 1996. Essential viewing more than essential reading! This book offers high-quality photos of the monkeys and apes discussed in this course (and other anthropoids). Especially useful as an aid for understanding the physical differences between monkeys and apes and between different kinds of great apes.

Savage-Rumbaugh, E. S., and R. Lewin. *Kanzi*. New York: John Wiley and Sons, 1994. Both entertaining and informative, this account explains how language research with the bonobo Kanzi unfolded and what findings it reached. Especially useful is the way in which the work with Kanzi is contextualized; we learn how it differs from earlier ape-language work, including breakthrough experiments by Savage-Rumbaugh herself when she was working with chimpanzees.

Small, Meredith. *Our Babies, Ourselves: How Biology and Culture Shape the Way We Parent*. New York: Anchor Books, 1998. How do babies cry, nurse, and sleep in societies around the world? Small takes on this question using the same biocultural context that we use in this course. That is, she asks about how biological trends and cultural customs intersect to influence parenting practices around the globe—and she does so engagingly.

Tattersall, Ian. *The Fossil Trail*. New York: Oxford University Press, 1995. Written by a top curator of human evolution exhibits at the American Museum of Natural History in New York, this book is intended for the general public. An enjoyable narrative guides readers through the maze of human ancestors and their significance to our understanding of our past.

Whiten, Andrew, et al. "Cultures in Chimpanzees." *Nature* 399 (1999): 682–685. This short article, published in the foremost journal of science in the world, is must reading, because it summarizes in compelling fashion the support for culture in chimpanzees. Group-specific behavioral patterns that occur because of social learning (and not because of differences in the environment) are found so often in chimpanzees, this article makes clear, that it is hard to deny them *culture* based on this definition.

Wrangham, Richard, and Dale Peterson. *Demonic Males*. Boston: Houghton-Mifflin, 1997. The authors make the case that we can understand patterns of human violence—especially male violence against women—only by understanding patterns of violence in great apes. This evolutionary argument, which considers the peaceful nature of the bonobos as well as the violent behaviors of other great apes, made *Demonic Males* a “water-cooler” book (one that got everyone talking)!

Supplementary Reading:

Altmann, Jeanne. *Baboon Mothers and Infants*. Cambridge: Harvard University Press, 1980. A somewhat mathematical exploration, this book reached a new level in understanding the intense mother-infant relationship in anthropoids. Altmann studied the savanna baboons of Kenya for many years and writes about topics of particular relevance to this course, including the process of weaning and the idea that different baboon mothers have different maternal styles toward their infants.

Bonner, John. *The Evolution of Culture in Animals*. Princeton, NJ: Princeton University Press, 1980. Ever consider the idea that the roots of culture might exist in bacteria? Bonner's learned and readable book might convince you to do so! This volume goes beyond the anthropoids to consider whether a broad array of animals might have social learning or culture.

de Waal, Frans. *Good-Natured: The Origins of Right and Wrong in Humans and Other Animals*. Cambridge: Harvard University Press, 1996. As is always the case with this author, de Waal provides a fascinating, up-to-date analysis of anthropoid behavior oriented around a single issue. Here, he asks whether the roots of morality can be seen in monkeys and apes, answering in the affirmative. Monkeys and apes cooperate and aid each other under certain circumstances.

Dennett, Daniel. *Darwin's Dangerous Idea*. London: Penguin Books, 1995. Evolution by natural selection is the “dangerous idea” of the title. Dennett explains how natural selection works, places the origins of the concept in

historical context, and examines modern challenges to it. By solidly supporting the importance of Darwin's idea of evolutionary theory, Dennett gives insight into the nature of Darwin's genius.

Fossey, Dian. *Gorillas in the Mist*. Boston: Houghton-Mifflin, 1983. The basis for the famous movie of the same name, this book chronicles Fossey's first fifteen years studying gorillas in Africa. She portrays many gorillas she came to know and love and discusses threats to the gorillas' survival, especially poaching. The book has heightened poignancy, because Fossey was murdered in her cabin in Africa—most likely by poachers—in 1985.

Johanson, Donald, and Maitland Edey. *Lucy*. New York: Simon and Schuster, 1981. Now somewhat dated, this book is nonetheless quite valuable for its account of field excavations in Ethiopia that led to the discovery of the famous "Lucy" fossil. Its discussion of Lucy's place in the "family tree" of hominids is now superseded because more recent finds have been made. It accurately conveys, however, the significance of finding a small-brained but bipedal human ancestor dating back to three million years ago.

Kano, Takayoshi. *The Last Ape*. Palo Alto, CA: Stanford University Press, 1992. The last of the great apes to be discovered, bonobos are profiled by the scientist who has studied them most thoroughly in the wild. Social and sexual behavior is given special prominence in this account translated from the Japanese.

Linden, Eugene. *The Parrot's Lament*. New York: Penguin, 1999. In this amusing book, Linden argues that animal intelligence should be studied not only under natural conditions but also in captive conditions. Tool-wielding zoo orangutan escape artists are of particular interest! The book does not limit itself to anthropoids but considers a wide variety of animals.

Parker, Sue, Robert Mitchell, and H. Lyn Miles. *The Mentalities of Gorillas and Orangutans*. Cambridge: Cambridge University Press, 1999. This edited collection makes the argument that the sophisticated mental powers of gorillas and orangutans deserve as much spotlight as do the better-known cognitive skills of chimpanzees and bonobos. Chapters by Fox et al., on orangutan tool use, and by Whiten and Tanner and Byrne, on the teaching and gestural skills of gorillas, are most relevant.

Russon, Anne. *Orangutans: Wizards of the Rainforest*. Westport, CT: Firefly Books, 2000. The orangutan, the large red ape of Asia, is now the single most endangered great ape of all. Russon studied "ex-captive" orangutans as they were being helped to readjust to their natural habitat in Borneo. In this satisfying account, she discusses orangutans' long childhood; their reliance on advanced learning skills, such as imitation; and the urgent need for great ape conservation.

Smuts, Barbara. *Sex and Friendship in Baboons*. Hawthorne, NY: Aldine de Gruyter, 1985. Smuts pioneered the concept of *friendship* between adult male and female monkeys. She defined friendship precisely, enabling her to measure it during her field studies among the baboons of Kenya. Her work has implications for understanding anthropoid mating patterns and for the debate about anthropomorphism.

Wallmann, Joel. *Aping Language*. Cambridge: Cambridge University Press, 1992. In profound disagreement with those who consider enculturated apes to be capable of complex linguistic skills, Wallmann assumes the role of skeptic in this book. He systematically questions the claims made by the scientists who lead some of the ape-language projects featured in this course, for example, the Washoe and Kanzi language projects.

Wise, Steven M. *Rattling the Cage*. Cambridge, MA: Perseus, 2000. In a provocative treatise, Wise considers whether some nonhumans, particularly bonobos and chimpanzees, deserve legal rights. After reviewing the evidence of these great apes' emotions and intelligence, he concludes that they do. This book has been broadly reviewed in the media and will soon be followed by Wise's second book considering the deserved legal status of other anthropoids.